

GERMAN PATENT OFFICE

*leather +
membrane*

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Title: Laminates with at Least One Microporous PTFE Membrane
and Finished Products Manufactured from these Laminates.

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P a t e n t C l a i m s

1. Laminate with at least one microporous PTFE membrane,
c h a r a c t e r i z e d b y
at least one layer
of a textile structure of chemical or natural fibers or a
combination of these fibers,
of a synthetic foam material,
of leather or leather imitation,
of paper or paper-like material,
of a gauze material, or
of a synthetic foil.
2. Laminate according to Claim 1, characterized thereby, that
the microporous PTFE membrane and/or the additional layer
is processed, e.g. finished, embossed, coated, printed, im-
pregnated, chintzed, singed, shrunk, flocked, doctored,
painted, or dyed.
3. Laminate according to Claim 1 or 2, characterized thereby,
that the textile structure is woven, crocheted, knitted,
tufted, felted, or velourized.

4. Laminate according to Claim 1 or 2, characterized thereby, that the synthetic foam material has open or closed pores and is coated with a synthetic material foil or a textile structure.
5. Garment, particularly coat, coverall, or similar, of a laminate according to one of the Claims 1 through 3, characterized thereby, that the laminate consists, from the outside inwards, of a taffeta of polyamide, a microporous PTFE membrane, and a layer of a polyamide knit.
6. Garment, particularly coat, anorak, pants, shirt, or similar, of a laminate according to one of the Claims 1 through 3, characterized thereby, that the laminate consists, from the outside inwards, of a taffeta of polyamide, a microporous PTFE membrane, and a layer of a velour material.
7. Garment according to Claim 6, characterized thereby, that the velour material consists of polyamide, cotton, or a mixture of these materials.
8. Garment, particularly coat, coverall, cape, suit, or similar of a laminate according to one of the Claims 1 through 3, characterized thereby, that the laminate consists, from the outside inwards, of a mixed material weave of polyester and cotton, a microporous PTFE membrane, a layer of a random fiber fleece of polyester, and a layer of a cotton knit or velour.
9. Garment, particularly coat or similar for clinical use, of a laminate according to one of the Claims 1 through 3, characterized thereby that the laminate consists, from the out-

side inwards, of a microporous PTFE membrane and a layer of a polyamide, cotton, or polypropylene knit.

10. Garment, particularly ski clothing, of a laminate according to one of the Claims 1 through 3, characterized thereby, that the laminate consists, from the outside inwards, of a layer of an elastic or bielastic weave, a microporous PTFE membrane, and a layer of an elastic or bielastic weave or knit.
11. Garment according to Claim 10, characterized thereby, that the outside weave consists of an elastomer and the inner knit of cotton.
12. Shoe or similar of a laminate according to one of the Claims 1 through 3, characterized thereby, that the laminate consists, from the outside inwards, of a layer of leather or leather imitation, a layer of a polyamide knit, a microporous PTFE membrane, and a layer of a polyamide knit or velour.
13. Shoe or similar, of a laminate according to one of the Claims 1 through 3, characterized thereby, that the laminate consists, from the outside inwards, of a layer of leather or leather imitation, a microporous PTFE membrane, and a layer of leather or leather imitation.
14. Sport shoe of a of a laminate according to one of the Claims 1 through 3, characterized thereby, that the laminate consists, from the outside inwards, of a layer of a polyamide oxford, a microporous PTFE membrane, a layer of chloroprene or PVC foam, and a layer of a polyamide or cotton knit.

15. Glove or similar of a laminate according to one of the Claims 1 through 3, characterized thereby, that the laminate consists, from the outside inwards, of a layer of fine leather, a microporous PTFE membrane, and a layer of a polyamide or cotton velour or knit.
16. Glove or similar of a laminate according to one of the Claims 1 through 3, characterized thereby, that the laminate consists, from the outside inwards, of a layer of a combination of leather and knit, a microporous PTFE membrane, and a layer of polyamide or cotton knit.
17. Glove or similar for clinical use, of a laminate according to one of the Claims 1 through 3, characterized thereby, that the laminate consists, from the outside inwards, of a microporous PTFE membrane and a layer of a polyamide, cotton, or polypropylene knit or velour.
18. Head covering, particularly cap, hat, hood, or similar of a laminate according to one of the Claims 1 through 3, characterized thereby, that the laminate consists, from the outside inwards, of a layer of a material with fashionable design, a microporous PTFE membrane, and a layer of felt material or leather imitation.
19. Life vest or similar of a laminate according to one of the Claims 1 through 3, characterized thereby, that the laminate consists, from the outside inwards, of a layer of a polyamide ripstop, a microporous PTFE membrane, a layer of open pore synthetic foam material, a microporous PTFE membrane, and a layer of a cotton or polyamide knit, velour, or weave.

20. Life vest or similar of a laminate according to one of the Claims 1 through 3, characterized thereby, that the laminate consists, from the outside inwards, of a layer of a polyamide taffeta, a microporous PTFE membrane, a layer of an open pore synthetic foam material, and a layer of cotton or polyamide velour, knit, or weave.
21. Sleeping bag or similar of a laminate according to one of the Claims 1 through 3, characterized thereby, that the laminate consists, from the outside inwards, of a layer of polyamide ripstop, a microporous PTFE membrane, a layer of random polyester fiber fleece, and a layer of a cotton or polyamide knit or weave.
22. Camping bag or similar of a laminate according to one of the Claims 1 through 2, characterized thereby, that the laminate consists, from the outside inwards, of a layer of polyamide weave, a microporous PTFE membrane, and a layer of a polyamide or cotton velour.
23. Carrying container, particularly rucksack, bag, suitcase, briefcase, or similar, of a laminate according to one of the Claims 1 through 3, characterized thereby, that the laminate consists, from the outside inwards, of a layer of a polyamide weave, a microporous PTFE membrane, and a layer of a polyamide weave or knit.
24. Container for liquids or similar of a laminate according to one of the Claims 1 through 3, characterized thereby, that the laminate consists, from the outside inwards, of a layer of a polyamide weave and a microporous PTFE membrane.

25. Container for food or similar of a laminate according to one of the Claims 1 through 3, characterized thereby, that the laminate consists, from the outside inwards, of a layer of a polyamide weave, a microporous PTFE membrane, and a layer of a polyamide weave.
26. Tent tarpaulin or similar of a laminate according to one of the Claims 1 through 3, characterized thereby, that the laminate consists, from the outside inwards, of a polyester ripstop, a microporous PTFE membrane, and a layer of a random fiber fleece of cotton and/or polyester.
27. Tarpaulins for vehicles, trailers, boats, or similar of a laminate according to one of the Claims 1 through 3, characterized thereby, that the laminate consists, from the outside inwards, of a layer of a polyester weave, a microporous PTFE membrane, a layer of a polyester knit or random fiber fleece.
28. Protective covering for animals of a laminate according to one of the Claims 1 through 3, characterized thereby, that the laminate consists, from the outside inwards, of a layer of a polyamide weave, a microporous PTFE membrane, a layer of a polyester random fiber fleece, and a layer of a cotton or polyamide knit or weave.
29. Breathing protection device for clinical use of a laminate according to one of the Claims 1 through 3, characterized thereby, that the laminate consists, from the outside inwards, of a microporous PTFE membrane and a layer of a weave or gauze of polyamide, polyester, or polypropylene.

30. Cover material for clinical use of a laminate according to one of the Claims 1 through 3, characterized thereby, that the laminate consists, from the outside inwards, of a micro-porous PTFE membrane and a layer of a weave, knit, or gauze of polyamide, polyester, or polypropylene.

DESCRIPTION

Laminates with at least one microporous PTFE membrane
and finished products manufactured from these laminates

The invention concerns laminates with at least one microporous PTFE membrane, and finished products manufactured from these laminates.

It is known how to manufacture weather protection materials from impregnated textile structures or from textile structures with synthetic coating. Although the impregnated materials generally "breathe", they are only conditionally waterproof. In case of the materials coated with synthetics, the situation is reversed, i.e. generally, they are sufficiently waterproof, but only conditionally do they "breathe". In the search for a material which is water proof and also "breathes", a microporous PTFE membrane has been found to be very useful; it is processed into a multilayered laminate to produce a material for weather protection clothing.

The purpose of the present invention is to further develop the known laminates with at least one microporous PTFE membrane, namely in such a manner that they can be utilized in various areas, e.g. professional wear or sports, or for clinical use.

According to the invention, this problem is solved by means of laminates according to the characterization portion of Claim 1. Hereby, the individual layers of these laminates may be finished or processed according to known procedures.

Desired final products, such as e.g. garments, shoes, gloves, headgear, sleeping bags, carrying containers, tarpaulins, etc. consisting of laminates with specific combinations are cited in the sub-claims. Specifically, these products (cf also particularly the overview table hereafter) offer protection against aggressive substances such as acids, lyes, or similar, so that they may advantageously be utilized as protective clothing in work environments. In addition, their use in the military is very advantageous, due to the protection they offer against weather and cold as well as against biological and chemical weapons. Since PTFE is physiologically harmless, these products may also advantageously be used in clinical environments. Additional characteristics of and application areas for the laminates according to the invention or final products manufactured from these laminates can be seen from the overview table in the following.

In the following, the characteristics of the microporous PTFE membrane will be described. The microporous PTFE material for the membrane is specifically manufactured according to a procedure known e.g. from the DT-AS 21 23 316 or DT-OS 24 17 901. For instance, the membrane has a thickness of only 0.025 mm and 1.4 billion pores per square centimeter. The maximum pore size amounts to 0.2 μ . PTFE is water repellent. Due to this characteristic and to the small pore dimension, a very high pressure is required, approx. 40 m water column, in order to press water through the pores. Water drops are approx. 20,000 times

larger than the pores of the microporous PTFE membranes. The molecules of water vapor, however, are 700 times smaller than the pores. Thus, to a great extent, these can diffuse through the membrane. Laboratory tests as well as practical tests have confirmed this model. The microporous PTFE membrane is therefore absolutely waterproof under all practical circumstances, and it also breathes.

Corresponding to the desired technical and aesthetical characteristics, such a microporous PTFE membrane can be concealed on one or on both sides by one or more layers of different materials. The concealment will be achieved e.g. by means of adhesives, adhesion agents, temperature, and/or pressure, according to the material of the additional layers.

The following materials may be used for these additional layers:

a) Chemical fibers such as viscose fibers, cupro-threads, acetate fibers, polyester fibers, polyacrylic fibers, polyacryl nitril fibers, polyurethane threads, polyolefin fibers, polyvinyl alcohol fibers, polyvinyl cyanide fibers, polyvinyl chloride fibers, polytetrafluoroethylene fibers, dual components fibers, or

natural fibers of cotton, flax, hemp, ramie, coconut, wool, silk, or similar, or

combinations of natural and chemical fibers in desired ratios.

These materials may be process into textile structures in known manners, e.g. by weaving, crocheting, knitting, tufting, felting, or velourizing.

- b) Foam materials with open or closed pores, e.g. of PVC, polyurethane, polyethylene, polystyrol, chloroprene, etc.
- c) Leather or leather imitations
- d) Paper or paper-like materials
- e) Gauze materials, net or grid materials
- f) Synthetic foils.

The resulting laminates and the final products manufactured from these laminates very advantageously combine the above cited characteristics of the microporous PTFE membrane and the applied concealing additional layers, such as e.g. the feel, the softness, and the attractive appearance of velour materials, or the elasticity of foam materials.

The following overview table shows concrete execution examples of laminates and their particular characteristics, namely of final products manufactured from these laminates and preferred application areas. The layered structure of the laminate is hereby always indicated in the sequence from the outside inwards. Since all laminates contain at least one microporous PTFE membrane, all products are naturally waterproof and breathing. These characteristics are specifically emphasized only for those laminates where they are of particular significance for the final product and the utilization area.

Seq. No.	Laminate	Particular Characteristics	Final product	Application area
1	<ul style="list-style-type: none"> - 70g/m² polyamide taffeta - Microporous PTFE membrane - 40g/m² polyamide knit 	Protection against aggressive media, e.g. acids, lyes, etc.	Coats, coveralls	Work, military
2	<ul style="list-style-type: none"> - 100g/m² polyamide taffeta - Microporous PTFE membrane - 80g/m² polyamide knit 	Wear resistant, pleasant to skin, tough, weldable	Anoraks, pull-over pants, ponchos, snow shirt, head-gear	Leisure wear, sports, work
3	<ul style="list-style-type: none"> - 80g/m² polyester/cotton mixed weave - Microporous PTFE membrane - 100g/m² random fiber polyester fleece - 50g/m² cotton knit 	Heat insulating, wearproof	Anoraks, pull-over pants, ponchos, snow shirt, head-gear	Mountaineering, work
4	<ul style="list-style-type: none"> - Microporous PTFE membrane - 45g/m² polypropylene knit 	Physiologically harmless, can be sterilized	Coats, aprons	Hospital
5	<ul style="list-style-type: none"> - 90g/m² elastomer weave - Microporous PTFE membrane - 60g/m² cotton knit 	Bielastic, wearproof, waterproof	Ski clothing	Skiing
6	<ul style="list-style-type: none"> - Leather, 2 mm thick - 40g/m² polyamide knit - Microporous PTFE membrane - 100g/m² polyamide velour 	Protection against aggressive media, e.g. acids, lyes, etc.	Shoes, boots	Work
7	<ul style="list-style-type: none"> - Leather, 1 mm thick - Microporous PTFE membrane - Leather, 1 mm thick 	Waterproof, breathing	Shoes, boots	Hiking, work

Seq. No.	Laminate	Particular Characteristics	Final Product	Application area
8	<ul style="list-style-type: none"> - 120g/m² polyamide oxford - Microporous PTFE membrane - Chloroprene foam, 2 mm thick - 40g/m² polyamide knit 	Easy care, waterproof, breathing	Sport shoes	Sports
9	<ul style="list-style-type: none"> - Fine leather 0.5 mm thick - Microporous PTFE membrane - 60g/m² polyamide knit 	Waterproof, breathing	Gloves	Work, sports
10	<ul style="list-style-type: none"> - Combination leather 0.5 mm thick and 100g/m² polyamide knit - Microporous PTFE membrane - 80g/m² cotton knit 	Heat insulating, wear-resistant, waterproof	Gloves	Sports
11	<ul style="list-style-type: none"> - Microporous PTFE membrane - 60g/m² polypropylene velour 	Sterilizabile, physio-	Gloves	Hospital, research
12	<ul style="list-style-type: none"> - 80g/m² polyester and cotton mixed weave - Microporous PTFE membrane - 80g/m² cotton felt 	Actively breathing, waterproof, pleasant to skin, fashionable	Hats	Casual, leisure
13	<ul style="list-style-type: none"> - 40g/m² polyamide ripstop - Microporous PTFE membrane - PVC foam, 4 mm thick - Microporous PTFE membrane - 60g/m² polyamide knit 	Heat insulating, floats	Lifeguard (wet suit?)	Work, sports, military

Seq. No.	Laminate	Particular Characteristics	Final Product	Application area
14	<ul style="list-style-type: none"> - 70g/m² polyamide taffeta - Microporous PTFE membrane - Polyester foam 5 mm thick - 80g/m² polyamide velour 	Heat insulating, floats	Wet suit with close-fitting edging at neck, arms, hips	Sports, work, military
15	<ul style="list-style-type: none"> - 45g/m² polyamide ripstop - Microporous PTFE membrane - 100g/m² random fiber polyester fleece - 60g/m² polyamide knit 	Heat insulating, floats, breathes	Sleeping bag	Mountaineering, military
16	<ul style="list-style-type: none"> - 60g/m² polyamide weave - Microporous PTFE membrane - 60g/m² polyamide knit 	Wear resistant, light, waterproof, breathing	Bivouac bag	Mountaineering, camping, military
17	<ul style="list-style-type: none"> - 100g/m² polyamide oxford - Microporous PTFE membrane - 80g/m² polyamide weave 	Light, tear resistant, waterproof, breathing	Rucksack, bag, suitcase, briefcase	Travel, sports, leisure, military
18	<ul style="list-style-type: none"> - 80g/m² polyamide taffeta - Microporous PTFE membrane 	Waterproof, breathing, chemically inert, light	Liquids container	Travel, expeditions, camping
19	<ul style="list-style-type: none"> - 60g/m² polyamide taffeta - Microporous PTFE membrane - 60g/m² polyamide taffeta 	Waterproof, breathing, wear resistant	Food container	Travel, camping
20	<ul style="list-style-type: none"> - 50g/m² polyester ripstop - Microporous PTFE membrane - 40g/m² random fiber cotton fleece 	UV-resistant, light, waterproof, breathing, tear	Tent tarpaulin	Camping, mountaineering, expeditions, military

Seq. No.	Laminate	Particular Characteristics	Final Product	Application area
21	<ul style="list-style-type: none"> - 80g/m² polyester weave - Microporous PTFE membrane - 80g/m² polyester knit 	UV-resistant, tear resistant, waterproof, breathing	Tarpaulins for transport vehicles, large tents, covers	Transportation, construction
22	<ul style="list-style-type: none"> - 60g/m² polyamide weave - Microporous PTFE membrane - 100g/m² random fiber polyester fleece - 40g/m² polyamide knit 	Heat insulating, waterproof, breathing, tear resistant	Protective covers	Animal care
23	<ul style="list-style-type: none"> - Microporous PTFE membrane - 40g/m² polypropylene 	Breathing, sterilizable, light, physiologically harmless	Breathing protection	Hospital
24	<ul style="list-style-type: none"> - Microporous PTFE membrane - 50g/m² polypropylene weave 	Sterilizable, physiologically harmless	Cover material	Hospital